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New Results of Moscow Cepheid Radial Velocity Programme

N. A. Gorynya[1], N. N. Samus[1], M. E. Sachkov[1], S. V. Antipin[2], A. S. Rastorgouev[2]

Abstract. A sequence similar to Hertzsprung progression was revealed for Cepheid radial-velocity curves. We separated two pulsation modes for six double-mode Cepheids and determined radii for five of them. Several new spectroscopic-binary Cepheids were discovered; we present new preliminary orbital periods for V496 Aql, VY Cyg, and V1334 Cyg, in a combined table of our results on Cepheid binarity.

Since 1987, we have been carrying out a large program of measuring radial velocities (RVs) of Cepheids using a CORAVEL-type spectrometer. By now, we have measured about 6760 RVs for more than 140 Cepheids. Three catalogues have been published (Gorynya et al. 1998 and references therein). The revised combined data of the three catalogues will be soon made available via INTERNET; the third catalogue can already be retrieved from:
`http://www.sai.msu.su/groups/cluster/gcvs/gcvs/cep/`
where the combined catalogue will also be deposited. These data, one of the richest bodies of original accurate RVs for Cepheids, can be used for studies of morphology of RV curves, for Baade–Wesselink studies, for research on the Galaxy's kinematics and dynamics, and for discoveries of spectroscopic binaries.

Recently, a Hertzsprung sequence of RV curves for classical Cepheids has been derived (Gorynya 1998). The similar sequence for light curves is well-known; but RV curves are easier to interpret theoretically, so this form of the sequence deserves special attention.

Thanks to the good coverage of the curves, it has become possible to separate pulsation modes for double-mode Cepheids based on RV curves only. We have separated modes for EW Sct, CO Aur, TU Cas, V367 Sct, BQ Ser, and BD $-10°4669$ (Samus & Gorynya 1991, Sachkov 1997, Antipin et al. 1999). Using the modification of Balona's method described in Sachkov (1997), we derived the radius of BD $-10°4669$: $\log R \approx 1.76$, in agreement with the value 1.73 predicted from the period–radius relation derived by Sachkov (1997). In the cited paper, Sachkov presents radii for CO Aur, TU Cas, EW Sct, and BQ Ser.

Our original Cepheid RVs are very effective for discoveries of new spectroscopic binaries (SBs), and for confirmations of suspected SBs. We have discovered, or definitely confirmed, spectroscopic binarity for MW Cyg, VZ Cyg, and BY Cas, and have published orbital solutions for a number of stars (Gorynya et al. 1996; Rastorgouev et al. 1997). Our new SB discovery is VY Cyg. Our main results on SB Cepheids are summarised in Table 1.

[1]Institute of Astronomy, 48 Pyatnitskaya Str., Moscow 109017, Russia
[2]Sternberg Astronomical Institute, 13 Universitetsky Ave., Moscow 119899, Russia

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Table 1. Spectroscopic Binary Cepheids

Cepheid	P_{puls} days	P_{orb} days	$a \sin i$ au	$f(m)$ $M_\odot$	M_1 $M_\odot$	M_2 $M_\odot$
FF Aql	4.4709	1434.2	0.67	0.02	5.5	$\geq 1 \pm 0.2$
V496 Aql	6.8072	1447 (573)				
RX Cam	7.9122	1116	1.2	0.19	6.5	$\geq 2.5 \pm 0.2$
SU Cas	1.9495	407.2	0.13	0.002	4	
BY Cas	3.2223	563		0.04		
DL Cas	8.0007	684.4		0.2784		
SU Cyg	3.8456	549.25	1.42	1.27	5.0	≥ 5
VY Cyg	7.8570	941				
VZ Cyg	4.8644	1483	1.39	0.16	5.5	$\geq 2 \pm 1.5$
MW Cyg	5.9547	437.3	0.25	0.011	6	$\geq 0.8 \pm 0.05$
V532 Cyg	3.2838	388?		0.0001?		
V1334 Cyg	3.3325	1947 (1463)				
TX Del	6.1659	133.3	0.17	0.037	6	$\geq 1.25 \pm 0.15$
Z Lac	10.8860	376.9	0.54	0.14	6	$\geq 0.8 \pm 0.1$
T Mon	27.0333	25000				
AU Peg	2.4115	53.34	0.22	0.49	4	$\geq 2.7 \pm 0.2$
AW Per	6.4636	1911?		0.016?		
S Sge	8.3823	675.75	0.93	0.23	6.5	$\geq 1.1 \pm 0.05$
V350 Sgr	5.1539	1481.8	1.34	0.15	5.5	$\geq 2.1 \pm 0.2$
BQ Ser	4.2707	136 (1009)		0.005		
SZ Tau	3.1489	1244?,340?				
EU Tau	2.1025	980?				

Remarks: *SU Cyg:* A triple system. *TX Del:* If a Pop. II Cepheid: $M_1 \approx 0.7 M_\odot$; $M_2 \geq 0.35 \pm 0.05 M_\odot$. *AU Peg:* If a Pop. II Cepheid: $M_1 \approx 0.7 M_\odot$; $M_2 \geq 1.2 \pm 0.1 M_\odot$. *AW Per:* SB2. *BQ Ser:* CEP(B), $P_0 = 4^d.27073$, $P_1 = 3^d.012$.

References

Antipin, S. V., Gorynya, N. A., Sachkov, M. E., et al. 1999, IBVS, No. 4718

Gorynya, N. A. 1998, IBVS, No. 4636

Gorynya, N. A., Rastorgouev, A. S., & Samus, N. N. 1996, Astron. Lett., 22, 33

Gorynya, N. A., Samus, N. N., Sachkov, M. E., et al. 1998, Astron. Lett., 24, 815

Rastorgouev, A. S., Gorynya, N. A., & Samus, N. N. 1997, in Binary Stellar Systems, ed. A. G. Massevich (Moscow: Kosmosinform), 123

Sachkov, M. E. 1997, IBVS, No. 4484

Samus, N. N. & Gorynya, N. A. 1991, Astron. Tsirk., No. 1550, 25